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ABSTRACT

A study described the backgrounds of Mississippi diversified technology secondary teachers and their attitudes toward the program; how the program is perceived by vocational counselors and vocational directors; how seriously committed to the program are school administrators; the teachers' and vocational directors' opinions regarding budget, teaching enrichment, course prerequisites, course content, course credits, course offerings, student recruitment, teacher training, curriculum, instructional materials, and equipment; and the strengths, weaknesses, and needs of the program. Data were collected by questionnaires completed by 44 diversified technology teachers, 42 vocational directors, and 42 counselors at all 44 vocational centers offering the program. The return rates for the three groups of professionals ranged from 95.5 to 100 percent. The following are among the findings reported: (1) most teachers came from industrial arts, science, or vocational education, with an average of 6.8 years of teaching experience; (2) a majority of teachers, counselors, and administrators reported their belief that the general public is not aware of the program, but teachers reported support for the program among counselors, administrators, and other teachers; and (3) a majority of directors reported that their central administration had provided an adequate budget, lab space, inservice training, and instructor preparation time. (The document includes two references, seven tables, and a chart illustrating the 2-year diversified technology curriculum for 11th and 12th graders.) (CML)

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A Study of the Diversified
Technology Program in Mississippi

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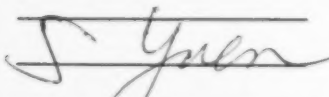
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A Study of the Diversified Technology Program in Mississippi

With technological changes occurring in telecommunications, computer applications, and advanced manufacturing technology, production processes and service delivery systems are allowing us to achieve higher productivity, better quality, greater efficiency, and lower costs. Today, robotics, computer-aided design, lasers, programmable controllers, automation, and computer numerical control are all examples of high technology equipment that industries are currently using in Mississippi. The development of new technologies and their adoption by business and industry are reshaping and placing new demands on education in Mississippi. Diversified Technology is a new high school educational program which responds to the training demands of those areas using advanced technology (Research and Curriculum Unit, 1986).

Although many states have similar programs, Diversified Technology is unique to Mississippi. Rather than teach students specific skills, it prepares them for continued education by providing a foundation in technical concepts and an understanding of how they are applied in industry. Diversified Technology also emphasizes hands-on learning and includes business survival skills, including leadership, inventory and quality control, and running your own business ("Mississippi Prepares," 1988). The lab experiences use computers, robots, systems trainers, application software, and business simulations to apply students' knowledge and solve technical problems.

Diversified Technology is conceptualized around six content areas:
(a) technology and systems, (b) electrical systems, (c) mechanical

systems, (d) fluid systems, (e) thermal systems, and (f) worklife skills. The laboratory is equipped with 20 different modules that the student is exposed to during Year 1 of the program. During Year 2, the student studies more advanced subjects pertaining to each of the modules. Both years of the curriculum are presented in Figure 1.

Diversified Technology is a two-year program aimed at providing 11th and 12th graders with a technologically literate base. The purpose of the Diversified Technology program is to prepare high school students with an interest in "high-tech" careers to go into postsecondary programs and specialize in one of the technical areas such as hydraulics, robotics, lasers, computer-aided design, etc. The program is designed to meet two hours per day for five days per week for a period of two years. Initially, five pilot programs were established throughout the state. Eleven were added during the 1986-1987 school year. Today there are 47 Diversified Technology programs established within vocational education centers throughout Mississippi in FY 89. It is expected that more programs will be added in Mississippi vocational centers in the next few years.

Purpose

The purpose of this study was to determine the demographic of the Diversified Technology program, its acceptance and implementation in Mississippi. Specific questions posed for the study were:

1. What are the Diversified Technology teachers' backgrounds and their attitudes toward the program?
2. How do vocational directors and counselors perceive Diversified Technology?

3. Do school administrators show serious commitment to the implementation of Diversified Technology?

4. What are the Diversified Technology teachers' and vocational directors' opinions regarding budget, teaching endorsement, course prerequisites, course content, course credits and offering, student recruitment, teacher training, curriculum, instructional materials, and equipment?

5. What are the strengths, the weaknesses, and the needs of the Diversified Technology program?

Methodology

Three sets of questionnaires were developed to collect data from vocational directors, Diversified Technology teachers, and counselors in all 44 vocational centers that offered the Diversified Technology program. There were 44 (100%) teachers, 42 (95.5%) directors, and 42 (95.5%) counselors completed and returned the questionnaires.

Findings

Teacher Backgrounds

Since there is no teacher training program that specifically prepares Diversified Technology teachers, teachers who have a license to teach in one or more areas such as industrial arts, science, physics, or math, or have T & I certification in electronics can become Diversified Technology teachers upon completion of a one-week staff development course in Diversified Technology. The results revealed that most of the Diversified Technology teachers came from the backgrounds of industrial arts, science, and vocational education with an average 6.8 years of

teaching experience. The complete background information about Diversified Technology teachers is presented in Table 1.

Attitudes Toward the Diversified Technology Program

To assess the attitudes of teachers, directors, and counselors toward the Diversified Technology program, each was asked to indicate their degree of agreement with each of the 13 items using a five point Likert-type scale ranging from 1 to 5 with 1 indicating Strongly Disagree to 5 indicating Strongly Agree. Table 2 presents the mean rating, the standard deviation, and the rank for each item. The items rated highest by teachers, directors, and counselors were statements 1, 2, and 4. However, they gave the lowest ratings to the statements 12 and 13.

Perception and Awareness of the Diversified Technology Program

Teachers reported that their administrators (88.6%), counselors (77.3%), and other teachers (65.9%) were positive about the Diversified Technology program at their schools. Diversified Technology teachers felt that the majority of administrators (77.3%), counselors (75%), other teachers (50%), and students (59.1%) were either fairly well or very well informed about the Diversified Technology program at their respective schools. However, a total of 54% of all teachers, directors, and counselors felt that the general public was not aware of the Diversified Technology program at their particular school.

Administrative Support

Most teachers (80%) indicated that the central administration at their schools had supported and promoted the Diversified Technology program. Furthermore, vocational directors reported that the central administration had provided the following support for their teachers: (a) adequate budget (95.2%), (b) laboratory space (90.5%), (c) inservice training (85.7%), (d) instructor preparation time (78.6%), (e) equipment fund (76.2%), and (f) support staff (73.8%).

Almost all directors agreed that they had provided adequate budget for Diversified Technology teachers. However, teachers reported that the average operating budget for a Diversified Technology program each academic year was \$1,082.93 and the average budget for a program should be \$1,745.92 each academic year.

Teaching Endorsement in Diversified Technology

Teachers and vocational directors were asked whether they were in favor of having a separate teaching endorsement or certificate for teaching Diversified Technology. The results show that 47.7% of the teachers and 45.2% of the directors were in favor of separate certification, while 29.5% of the teachers and 16.7% of the directors were undecided. Table 3 shows the suggested course requirements for becoming a Diversified Technology teacher as reported by directors and teachers.

Course Prerequisites

Table 4 shows the courses that a high school student should have before enrolling in the Diversified Technology program. The majority of teachers and directors indicated that Algebra I should be the required

course before taking Diversified Technology. In addition, they indicated that it was desirable for students to have algebra II, geometry, physics, and typing before enrolling in Diversified Technology.

Course Content

The teachers and directors were asked to identify the field of technology that should be added to the current Diversified Technology program. The results indicated that the fields of technology that should be added to the current Diversified Technology program as recommended by the teachers were tele-communications (90.9%), followed by optical systems (57.1%), instrumental and control (54.4%), and computers (45%). Similarly, the directors recommended tele-communications (78.6%) should be added to the program, followed by optical systems (45.2%), instrumental and control (40.5%), and computers (31%).

Course Credits and Offering

In questioning whether applied physics credits should be given to the students who completed the Diversified Technology program, the results revealed that teachers (84.1%), directors (95.1%), and counselors (95.1%) were overwhelmingly in favor of granting applied physics credit for Diversified Technology students. The majority of teachers (65.9%), directors (76.2%), and counselors (78.6%) indicated that they would like to expand the Diversified Technology program and offer it to adults.

Student Recruitment

Eighty percent of the teachers reported that counselors assisted in recruiting students for the Diversified Technology program at their schools. However, Diversified Technology teachers indicated that the greatest effort in recruiting students for the Diversified Technology program came from teachers themselves (46.5%), followed by counselors (27.9%), students (20.9%), and vocational directors (4.7%).

Teacher Training

Of the 44 teachers, only one had not received a one-week staff-development course in Diversified Technology. The staff-development course is normally required for a new Diversified Technology teacher and is conducted by the Mississippi State Department of Education each summer. Forty-three percent of the teachers said they were well satisfied with the quality of training received in the staff-development course and 50% said they were more satisfied than dissatisfied.

Eighty-eight percent of the teachers reported that they were either comfortable or very comfortable with teaching Diversified Technology. Almost all teachers (97.7%) indicated that they had benefited from teaching Diversified Technology classes and 95.5% of the teachers said that they would volunteer to teach Diversified Technology if they had it to do over. In addition, 89.6% of the teachers expressed an interest in taking additional courses or workshops for teaching Diversified Technology.

Curriculum, Instructional Materials, and Equipment

Ninety-five percent of the teachers agreed that Diversified Technology curriculum challenged or matched student ability and 82% of

the teachers were in favor of standardized activity workbooks. To shed some light on the question of satisfaction, teachers were asked if they were satisfied with the quality of available equipment, available instructional materials, and the current curriculum. The results indicated that the majority of teachers were satisfied with the quality of available equipment (86.4%), available instructional materials (65.9%), and the curriculum (72.7%).

Strengths, Weaknesses, and Needs of the
Diversified Technology Program

Table 5 presents the eight specific factors from which the directors and teachers identified the greatest strengths of their programs. Staffing was selected by the directors as an area of greatest strength in the Diversified Technology program at their schools. The second most often cited strength by the directors was course content. Course content was the greatest strength and administrative support was the second most often cited strength in the Diversified Technology program as reported by the teachers.

Table 6 presents the nine specific factors from which the directors and teachers identified the greatest weakness of their programs. Enrollment was the area most often cited as a major weakness by teachers (47.6%) and directors (50%).

As illustrated in Table 7, the largest percentage of teachers (40.5%) said their greatest need in the Diversified Technology program was for laboratory materials. Others reported that their area of greatest need was for student enrollment (21.4%) or for instructional materials (19%).

Recommendations

Overall, the Diversified Technology program has made a good start in Mississippi. Most teachers, directors, and counselors are enthusiastic about the Diversified Technology program and there is general support for the program. However, based on the findings of this study and the suggestions from the participating teachers, directors, and counselors, the following recommendations are offered in order to ensure the success of the Diversified Technology program in Mississippi:

1. A statewide public campaign should be launched to publicize the Diversified Technology program so that parents, students, and the general public are more informed about the Diversified Technology program.
2. A concerted effort should be made to recruit more qualified students into the program.
3. The State Department of Education and teacher education institutions should work together to develop a teacher training model for preparing qualified Diversified Technology teachers.
4. Workshops or inservice training programs should be developed to update teachers' knowledge in different content areas of Diversified Technology.
5. The State Department of Education, universities, Research and Curriculum Unit (R/CU), and Diversified Technology teachers should work together to continually update the curriculum, lab activity materials and instructional materials. Organized learning materials such as textbooks and standardized activity workbooks should be developed to

assist students in learning Diversified Technology. Furthermore, the State Department of Education, universities and R/CU should support information dissemination and provide expertise and resources to Diversified Technology teachers.

6. The State Department of Education should provide funding for research to monitor, and evaluate the quality of the Diversified Technology program. In addition, program evaluation procedures and standards for the Diversified Technology program should be developed.

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Table 1

Diversified Technology Teachers Profile

Variable	<u>n</u>	<u>%</u>
Sex		
Female	4	9.1
Male	40	90.9
Age		
Under 30	9	20.5
30-39 years	16	36.4
40-49 years	11	25.0
over 49 years	8	18.2
Educational level		
Associate's degree	1	2.3
Bachelor's degree	18	41.9
Master's degree	18	41.9
Beyond master's degree	6	11.6
Other	1	2.3
Teaching certificate		
Emergency	1	2.3
A	28	65.1
AA	10	23.3
AAA	4	9.3
Teaching endorsement ^a		
Industrial arts	15	37.5
Science	14	35.0
Vocational education	12	30.0
Math	8	20.0
Administration	6	15.0
Computer science	5	12.5
Social Studies	1	2.5

(table continued)

Table 1 - Continued

Variable	<u>n</u>	<u>%</u>
Teaching experience prior to becoming a Diversified Technology teacher ^a		
Math	15	37.5
Physics	5	12.5
Physical science	9	22.5
Industrial arts	17	42.5
Vocational areas	10	25.0
Other	23	57.5
Working experience related to Diversified Technology subject matter		
0 year	11	26.2
1-4 years	6	14.3
5-9 years	11	26.2
10-14 years	5	11.9
15-19 years	3	7.1
20 or more years	6	30.0
Area of occupational and teaching experience ^a		
Technology and systems	19	44.2
Electrical systems	32	74.4
Mechanical systems	28	65.1
Fluid systems	22	51.2
Thermal systems	15	34.9
Worklife skills	19	43.2
None of above	7	16.3
Course taken in college ^a		
Math	38	88.4
Physics	26	60.5
Computer science	22	50.0
Electronics	23	52.3
Industrial arts	22	50.0
Engineering	8	18.6

^aPercentages add up to more than 100% due to multiple responses.

Table 2

Attitudes of Teachers, Directors, and Counselors
Toward the Diversified Technology (DT) Program

Item	<u>M</u>	<u>SD</u>	Rank
1. DT teaches students skills useful in technical careers.	4.55 4.57 4.67	0.76 0.77 0.61	2 (A) 1 (B) 2 (C)
2. DT provides students with a foundation for pursuing a challenging career in high technology.	4.77 4.49 4.68	0.47 0.94 0.61	1 (A) 2 (B) 1 (C)
3. DT helps students adapt themselves to the workforce and its changing demands.	4.33 4.17 4.41	0.68 0.91 0.63	8 (A) 7 (B) 9 (C)
4. DT addresses the needs of the technical workforce and prepares students to seek further training in a junior college.	4.52 4.38 4.64	0.66 0.88 0.49	3 (A) 4 (B) 3 (C)
5. DT helps students understand how to enter and advance in technology related occupations.	4.41 4.15 4.45	0.73 0.95 0.63	6 (A) 8 (B) 7 (C)
6. DT helps students develop leadership and management skills.	4.02 3.88 4.14	0.70 1.04 0.73	11 (A) 12 (B) 11 (C)
7. DT helps students learn the issues, dimensions, and uses of technology in society.	4.23 4.14 4.43	0.77 0.90 0.63	9 (A) 9 (B) 8 (C)

(table continued)

Table 2 - Continued

Item	<u>M</u>	<u>SD</u>	Rank
8. DT helps students learn the components of a technical system and how to solve problems within systems.	4.43	0.59	5 (A)
	4.31	0.98	5 (B)
	4.60	0.59	4 (C)
9. DT teaches students how advanced technology works and how to solve related technical problems.	4.34	0.61	7 (A)
	4.26	0.86	6 (B)
	4.50	0.55	6 (C)
10. DT helps students learn the underlying principles at work in technical systems.	4.50	0.55	4 (A)
	4.48	0.92	3 (B)
	4.59	0.55	5 (C)
11. DT helps students learn skills in participation and communication.	4.11	0.81	10 (A)
	4.02	0.81	10 (B)
	4.19	0.63	10 (C)
12. DT teaches students skills in quality control and inventory control.	3.86	0.70	12 (A)
	4.00	0.83	11 (B)
	4.00	0.80	12 (C)
13. DT teaches students skills in entrepreneurship.	3.75	0.78	13 (A)
	3.86	0.95	13 (B)
	3.83	0.79	13 (C)

Note. (A)=Teachers; (B)=Directors; (C)=Counselors.

Table 3

Course Requirements for Becoming A Diversified
Technology Teacher As Suggested by Teachers and Directors

Course	Teacher (n=41)			Director (n=39)		
	Number	$\bar{x}$	Ave Credits	Number	$\bar{x}$	Ave Credits
Science	36	87.8	14.2	32	82.1	10.4
Mathematics	38	92.7	13.2	36	92.3	10.5
Technology	32	78.0	12.9	33	84.6	14.5
Vocational Education	24	58.5	14.3	31	79.5	18.2
Other	10	24.4	13.6	0	0.0	0.0

Table 4

Prerequisites for Enrollment in Diversified Technology
As Recommended by Teachers and Directors

Course	Teacher				Director			
	Desirable		Required		Desirable		Required	
	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
General Math	9	20.5	21	47.7	9	21.4	19	45.2
Pre-Algebra	9	20.5	11	25.0	11	26.2	9	21.4
Algebra I	2	4.5	42	95.5	7	16.7	34	81.0
Algebra II	26	59.1	2	4.5	22	52.4	3	7.1
Geometry	29	65.9	5	11.4	27	64.3	4	9.5
Trigonometry	25	56.8	1	2.3	15	35.7	1	2.4
Physical Science	17	38.6	16	36.4	16	38.1	15	35.7
Physics	30	68.2	1	2.3	20	47.6	1	2.4
Basic Vocational Education	10	22.7	3	6.8	19	45.2	4	9.5
Industrial Arts	13	29.5	4	9.1	21	50.0	3	7.1
Chemistry	21	47.7	1	2.3	14	33.3	1	2.4
Typing	30	68.2	7	15.9	23	54.8	6	14.3
English Composition	17	38.6	15	34.1	9	21.4	15	35.7

Table 5

Greatest Strengths of the Diversified Technology Program
As Reported by Teachers and Directors

Greatest Strengths	Teacher		Director	
	<u>n</u>	<u>$\bar{x}$</u>	<u>n</u>	<u>$\bar{x}$</u>
Administrative support	10	23.3	8	19.5
Course content	14	32.6	10	24.4
Enrollment	1	2.3	1	2.4
Facility	6	14.0	1	2.4
Funding	2	4.7	0	0.0
Methodology	3	7.0	2	4.9
Resources	3	7.0	3	7.3
Staffing	4	9.3	16	39.0

Table 6

Greatest Weaknesses of the Diversified Technology Program
As Reported by Teachers and Directors

Greatest Weaknesses	Teacher		Director	
	<u>n</u>	<u>$\bar{x}$</u>	<u>n</u>	<u>$\bar{x}$</u>
Administrative support	2	4.8	1	2.4
Course content	5	11.9	5	11.9
Enrollment	20	47.6	21	50.0
Facility	1	2.4	1	2.4
Funding	5	11.9	1	2.4
Methodology	2	4.8	3	7.1
Resources	6	14.3	4	9.5
Staffing	1	2.4	2	4.8
Other	0	0.0	4	9.5

Table 7

Areas of Greatest Need in the Diversified
Technology Program

Area of need	Teachers reporting	
	<u>n</u>	<u>$\bar{x}$</u>
Lab activities materials	17	40.5
Student enrollment	9	21.4
Instructional materials	8	19.0
Equipment	4	9.5
Administrative support	2	4.8
Other	2	4.8
Faculty support	0	0.0
Personal knowledge	0	0.0

Fig. 1 Diversified Technology Curriculum

Modules of Instruction Year One

Module 1: Course Review	Module 5: Introduction to Robotics	Module 9: Introduction to Lasers	Module 13: Understanding Thermal Systems	Module 17: Inventory Control Methods
Module 2: Introduction to Technology	Module 6: Computer Numerical Control Fundamentals	Module 10: Understanding Mechanical Systems	Module 14: Effective Technical Writing	Module 18: Effective Leadership
Module 3: Introduction to Systems	Module 7: Programmable Controller Applications	Module 11: Understanding Fluid Systems	Module 15: Managing Time and Resources	Module 19: Running Your Own Business
Module 4: Microcomputer Fundamentals	Module 8: Computer Aided Design Fundamentals	Module 12: Understanding Electrical Systems	Module 16: Quality Control and Work Groups	Module 20: Course Review

Modules of Instruction Year Two

Module 1: Understanding Mechanical Systems	Module 5: Understanding Electronic Systems	Module 9: Lasers	Module 13: Quality Control	Module 17: Basic Industrial Safety
Module 2: Understanding Fluid Systems (Pneumatics)	Module 6: Computer Numerical Control	Module 10: Robotics Systems Applications	Module 14: Effective Leadership	Module 18: Advanced Inventory Control Concepts
Module 3: Understanding Fluid Systems (Hydraulics)	Module 7: Programmable Controller Applications	Module 11: Understanding Thermal Systems	Module 15: Managing Time and Resources	Module 19: Systems Fluid Analysis
Module 4: Microcomputer Applications	Module 8: Computer Aided Design	Module 12: Effective Writing	Module 16: Running Your Own Business	